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THE EXAMINATION OF SOME DRUGS WITH SPECIAL REFERENCE TO THE ANHYDROUS ALCOHOL AND ETHER EXTRACTS AND ASH.

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In the examination of a number of commercial samples of vegetable drugs in addition to identifying the samples and making specified tests for added or accidental impurities, such as starch, etc., we have attempted to make some assays that would serve as a means of determining the relative value of the sample when compared with some other sample or standard.

These assays have consisted chiefly in determining anhydrous extracts, using as menstruum, water, alcohol, alcohol and water, ether, chloroform or petroleum ether, as may be suggested by the nature of the drug. Some of the drugs included in this report have established extract standards; for example: aloes, gambir and gamboge by the U. S. P., and the spices, such as capsicum and cloves by the government.

The determination of the anhydrous soluble or insoluble matter of a drug may not directly estimate its therapeutic activity, but in the absence of any other means of determining its therapeutic value, without a doubt, the physician would prefer to use a preparation made from a good grade of drug assaying 25 per cent. anhydrous extract with the proper menstruum than a similarly good grade of the same drug assaying 15 per cent.

For the manufacturer, it serves to enable him to select a drug that will give a high yield of extract, thereby making a good product, in the case of solid or powdered extracts or a rich appearing preparation, as in the case of fluidextracts, tinctures, etc.

For the chemist, it serves as an aid in identification or comparison of a sample, especially a ground or powdered sample, with a standard selected from a good grade of whole drug; the determination of partial extraction of the drug, as we have found in capsicum; deterioration due to faulty storage or packing, as in drugs rich in volatile substances or fixed oils; or inferiority due to added or accidental impurities which do not yield soluble constituents to the menstruum used.

In making these statements we recognize the fact that a drug may assay high in extractive matter and at the same time contain a low percentage of the principles that give it its chief therapeutic activity.

As stated above, the drugs included in this report were samples submitted for examination which were chiefly in a ground or powdered state. For comparison, samples of selected whole drug were examined in the same manner and the results taken as standards. This examination of selected whole drugs has necessarily been limited, and the figures have to be given considerable latitude until a sufficient number of selected samples from various sources and different seasons can be assayed.

The drugs containing alkaloids have been found to vary in their alkaloidal content with different seasons and from different localities, and it can be assumed that many drugs will vary likewise in their extract content.

Several of the drugs included in this report contain alkaloids or other principles which may be approximately determined and serve as a means of judging of their value. Owing to lack of time, we have given the determination of these constituents very little attention as yet.

METHODS.—DETERMINATION OF ANHYDROUS EXTRACT: Transfer 2 grammes of the sample in fine powder (or not less than No. 40 powder) to an eight ounce flint bottle stoppered with a best grade cork. Add 100 Cc. of the menstruum, mix thoroughly and set aside 12 to 18 hours (over night), shake in mechanical shaker for 3 hours and then set aside for a few minutes to settle. Filter through a fluted filter. If the filtrate is cloudy a small quantity of kieselguhr may be of some aid in obtaining a clear filtrate. Transfer 50 Cc. of the filtrate representing 1 gramme of the drug to a tared 5 oz. beaker, evaporate on water bath and dry to constant weight at 100° C. If the extract content is high it is advisable to use less of

the filtrate. Where the alcoholic menstruum used in determining the anhydrous alcohol extract was of a percentage other than 95 per cent. absolute alcohol, the percentage is indicated by the figure in brackets; for example, arnica flowers (10079) contained 20.63 per cent. with a dilute alcohol menstruum (49) [20.63 (49)].

INSOLUBLE MATTER is determined by collecting on balanced filters, washing with the menstruum until the washings are free from extractive and drying the residue at 100° C.

THE VOLATILE ETHER EXTRACT is determined by allowing the 50 Cc. of the filtrate in the tared beaker to evaporate spontaneously and then drying in a vacuum desiccator over sulphuric acid at room temperature to constant weight. The extract is then dried to constant weight at 100° C. The loss of weight in the last operation is calculated to volatile ether extract and the residue in the beaker to anhydrous ether extract.

MOISTURE, or loss in weight upon drying, is determined by weighing about 1 gramme of sample into a 5 oz. tared beaker or a 3 inch watch glass and drying either at 100° or 105° C.

ASH is determined by igniting in either a platinum or silica crucible, usually platinum, with the aid of a blast.

The results of the assays are given in the table on pp. 436-444.

Aloes.—The determination of the anhydrous aqueous extract is very unsatisfactory, owing to the difficulty of obtaining check assays. The figures given in the table are approximate only.

Benzoin.—The Sumatra benzoin which usually contains cinnamic acid can be distinguished¹ from Siam benzoin, which does not contain cinnamic acid by heating a small quantity with a little soda and water and warming the filtrate with potassium permanganate, when the odor of bitter almonds will be developed.

Cannabis Indica.—The sample (9826) referred to in the table and found to contain 36.58 per cent. seed, was tested physiologically, after removing the seeds, by feeding a 13 kilo dog with the extract from 2 gms. It compared very favorably with a selected sample.

Colocynth.—Sample 9548 containing 96.63 per cent. pulp, 1.27 per cent. seed and 1.80 per cent. peel, showed other than pulp tissue, stone cells from the peel and a few aleurone grains from the seed. Samples 9674 and 9675 containing 1.17 and 0.79 per cent. seed and 0.50 and 0.16 per cent. pulp, respectively, showed practically no aleurone grains or stone cells.

¹A. Pharm., 1892, CC XXX thru U. S. D., 19th edition. 232.

TABULATION OF ASSAYS.

Sample	Sample No.	Moist	Alc. Ext.	Water Ext.	Ether Ext.	Ash	Sol. Ash. HCl	Remarks
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
Acacia Pow.	9,917	10.09				2.35		
Acacia Pow.	9,967	9.88				2.47		
Acacia Pow. 1st	10,040	9.43				2.48	Soluble	
Acacia Pow. 2nd	10,092	9.89				2.68	Soluble	
Acacia Pow. 2nd	10,438	9.02				2.55	Soluble	
Acacia Pow. 1st	10,577	9.12				2.62	Soluble	
Acacia Gran. 1st	10,670	11.85				2.52	Soluble	
Allspice Pow.	10,477		11.05		6.26	3.64		Vol. Ether Ext. 2.1%
Aloes Barb. Pow.	9,706	4.67	90.20	66.05				
Aloes Barb. Pow.	10,180	7.19	83.07	68.72		2.56	Pract. all	
Aloes Barb. Pow.	10,740	10.60	87.25	72.76		1.09	Soluble	
Aloes Cape Pow.	9,687	5.42	91.45	64.19				
Aloes Cape Pow.	10,198	5.37	94.17	59.80		0.65		
Aloes Cur. Pow.	10,432	5.43	91.73	68.30		1.84		
Aloes Cur. Pow.	10,629	12.94	85.95	75.09		1.46	Soluble	
Aloes Soc. Pow.	9,782	5.64	89.15	37.84		5.65	Pract. all	
Aloes Soc. Pow.	10,210	5.72	82.52	34.80		4.80		
Aloes Soc. Pow.	10,240	5.80	85.83	49.58		1.59		
Aloes Soc. Pow.	10,241	5.30	82.44	54.37		4.15	Soluble	
Althaea Rt. Cut.	9,810					6.86	Soluble	
Althaea Rt. Cut.	9,811					6.95	Pract. all	
Angelica Seed Grd.	9,852		26.77		27.90	6.90	Soluble	
Anise Seed Pow.	10,668		20.63 (49)			5.85	Pract. all	
Arnica Fl. Grd.	10,079		20.62 (49)			8.72	Pract. all	
Arnica Fl. Grd.	10,091		98.75 ¹			8.22		
Balsam of Tolu.	10,000		98.66					Alc. insol. 1.25%
Balsam of Tolu.	10,044		98.50					Alc. insol. 1.33%
Balsam of Tolu.	10,085		99.05					Alc. insol. 1.30%
Balsam of Tolu.	10,316		99.05					Alc. insol. 0.95%
Benzoin Siam.	10,031		94.22 ¹			0.54	Pract. all	Alc. insol. 5.78%

Benzoin Siam.....	10,032	92.63			0.65	Pract. all	Alc. insol. 7.37%
Benzoin Siam.....	10,033	92.78			0.80	Pract. all	Alc. insol. 7.22%
Benzoin Siam.....	10,034	90.89			0.60	Pract. all	Alc. insol. 9.11%
Benzoin Siam.....	10,057	84.98			0.90	Pract. all	Alc. insol. 15.02%
Benzoin Siam.....		89.35			1.25	Pract. all	Alc. insol. 10.65%
Benzoin Siam.....	10,388	93.60			0.66		Alc. insol. 6.40%
Benzoin Sum. Pow. ..	9,355	85.24			0.83		Alc. insol. 14.76%
Benzoin Sum. Pow. ..	9,542	76.00			1.85	Soluble	Alc. insol. 24.00%
Benzoin Sum. Pow. ..	10,566	74.75			1.48		Alc. insol. 25.25%
Calumba Rt. Pow.	9,445	10.38(65)			6.06	Pract. all	
Calumba Rt. Pow.	9,830	12.25(65)			6.36	Pract. all	
Calumba Rt. Pow.	10,469	12.55(65)			6.10		
Cannabis Indica.....	9,826	11.76					Garbled = 36.58% Seed
Cannabis Indica with- out seed.....	9,826	15.03	12.10				
Cannabis Indica Seed.	9,826	6.10	30.50				
Cannabis Indica.....	10,161	13.11			14.44		
Cannabis Indica.....	10,328	13.50					
Cannabis Indica Grd.	10,162	12.57			14.20		
Cantharides Pow.	9,421	20.94			6.50		
Cantharides.....	10,198	7.00			6.40		
Capsicum Grd.....	9,680	21.48	17.78		5.36		Sample from grocery store
Capsicum Grd.....	9,681	7.80	4.01		6.40		
Capsicum Grd.....	9,937	19.95	17.38		4.79		
Capsicum Pow.	10,116	21.72	15.31		5.76	Pract. sol	Vol. Ether Ext. 3.30%
Capsicum Pow.	10,701	5.62	19.82		6.00	Pract. sol.	Vol. Ether Ext. 1.61%
Capsicum Pow.	10,827	21.84	13.37		6.31	Pract. sol.	Vol. Ether Ext. 0.87%
Cardamom Wh.....	10,507A	4.45	2.28		3.65	Partly sol.	Garbled = 72% Seeds 28% hulls
Cardamom Seed.....	10,507A	2.70	1.62		4.04	Mostly insol.	
Cardamom Hulls.....	10,507A	8.20	3.80		0.24	Partly insol.	Hulls from whole sam- ple cont. 73% Seed
Cardamom Hulls.....	10,507B	9.25	4.40				

¹ Alcohol extract calculated from difference, sample taken and alcohol insoluble.

TABULATION OF ASSAYS.—Continued.

Sample	Sample No.	Moist.	Alc. Ext.	Water Ext.	Ether Ext.	Ash	Sol. Ash. HCl	Dil.	Remarks
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.			
Cardamom Seed.....	10,507B		3.10		2.10	7.60	Insol.		Vol. Ether Ext. 1.00%
Cardamom Seed Pow.	10,439		4.55		2.02	7.55	Mostly insol.		
Cardamom Seed Pow.	9,419					4.86	Soluble		
Cardamom Seed.....	10,590		8.93	25.00	2.89	4.82	Soluble		
Cascara Sag. Grd.....	10,532	6.70		28.18		4.14	Mostly sol.		
Cascara Sag. Pow.....	10,471								
Catechu Sag. Grd.....			27.80(39)			2.86			
Catechu Pow.....	10,166	10.56	65.75			2.51			
Catechu Pow.....	10,473	9.22	65.25			8.55			
Caulophyllum.....	9,439		24.64(72)			9.11	Partly sol.		
Celery Seed Pow.....	9,627		29.90			12.18	Partly sol.		Vol. Ether Ext. 1.50%
Celery Seed.....	10,756		21.44		30.23	25.45	Partly sol.		Vol. Ether Ext. 2.54%
Celery Seed Pow.....	10,816		23.90		21.10	14.50	Soluble		Vol. Ether Ext. 0.74%
Cinnamon Cassia Wh.	10,763		8.40		1.96	1.79	Mostly sol.		
Cinnamon Cas. Pow..	9,853		7.43		2.88	3.02	Mostly sol.		Vol. Ether Ext. 0.88%
Cinnamon Cas. Pow..	9,963		8.79		2.60	3.50	Soluble		Vol. Ether Ext. 2.45%
Cinnamon Cas. Pow..	9,964		7.55		2.95	3.16	Soluble		Vol. Ether Ext. 3.55%
Cinnamon Cas. Pow..	10,702		6.57		1.30	2.23	Soluble		Vol. Ether Ext. 0.54%
Cinnamon Ceylon Wh.	10,765		10.84		1.66	3.54	Soluble		Vol. Ether Ext. 2.56%
Cinnamon Saigon Wh.	10,764		6.01		1.74	2.47	Soluble		Vol. Ether Ext. 1.70%
Cinnamon Saigon Pow.	9,551		7.55		2.90	3.30			Vol. Ether Ext. 2.16%
Cinnamon Saigon Pow.	10,815		6.57		3.36	3.80			
Cloves Wh. free from stems.....	10,757		15.40		7.30	4.00	Soluble		Vol. Ether Ext. 18.45% cont. 4.8% stems
Cloves Pow.....	10,055	22.24 ²	15.61		7.40	5.34	Soluble		Vol. Ether Ext. 10.46
Cochineal Pow.....	10,050	6.98				4.97	Mostly insol.		Tests for foreign colors—negative
Cochineal Pow.....	10,433		22.00(49)			3.60			Pet. Ether Ext. 12.58%
Colocynthis Apple Grd.	9,238		14.22(49)			3.73			
Colocynthis Apple Wh..	9,450								

Colocynthis Apple Pulp	9,450	43.20(49)	9.20	Soluble	Pet. Ether Ext. 0.44%
Colocynthis Apple Seed	9,450	5.2 (49)	1.96	Mostly insol.	Pet. Ether Ext. 15.56%
Colocynthis Pulp	9,548	42.55(49)	13.03	Soluble	Pet. Ether Ext. 0.77%
Colocynthis Pulp, no seed	9,548	43.46(49)	13.03	Soluble	Pet. Ether Ext. 0.65%
Colocynthis Pulp, no seed	9,674	40.00(49)	12.68	Soluble	Pet. Ether Ext. 1.00%
Colocynthis Pulp, no seed	9,675	42.75(49)	12.10	Soluble	Pet. Ether Ext. 0.64%
Colocynthis Pow.	9,395	29.49(49)	6.12		Pet. Ether Ext. 4.40%
Colocynthis Pow.	9,510	31.90(49)	9.87		Pet. Ether Ext. 1.21%
Colocynthis Pow.	9,511	39.51(49)	12.68		Pet. Ether Ext. 0.74%
Conium Lvs. Pow.	10,470		15.66	Mostly sol.	
Coriander Wh.	10,758	21.20	5.49	Soluble	Vol. Ether Ext. 0.30%
Coriander Pow.	9,860		7.20	Mostly sol.	
Cubeb Pow.	10,068		6.00	Mostly sol.	
Dragons Blood Reed.	A	9.26	7.39	Mostly insol.	Color deep vermil. red
Dragons Blood Lump.	B	55.98	3.53	Mostly insol.	Color deep vermil. red
Dragons Blood Pow.		72.20	3.60	Mostly insol.	Color deep vermil. red
Dragons Blood Pow.	1,95	79.05	64.52	Mostly insol.	Color light rose
Dragons Blood Pow.	9,854	75.18	74.04	Mostly insol.	Color light rose
Dragons Blood Pow.	10,144	74.28	76.54	Mostly insol.	Color light rose
Dragons Blood Pow.	10,174	62.30	79.40	Mostly insol.	Color light rose
Elder Flow. Grd.	10,817	20.15(49)	64.66	Pract. sol.	
Fennel Seed.	9,847		7.65		
Fennel Seed.	10,508		7.93		
Fennel Seed Pow.	10,445	12.45	8.45	Pract. sol.	Pet. Ether Ext. 6.26%
Fenugreek Pow.	9,848	9.19	4.55		
Galangal Rt.	9,463		5.33		
Galangal Rt. Pow.	9,418		5.38		
Galangal Rt. Pow.	10,013	10.04	7.12	Partly sol.	
Gambir Gran.	10,259	6.64	8.74	Mostly insol.	
Gambir Gran.	10,335	64.60	9.23		
Gambir	10,569	64.50	3.57		Alc. insol. 13.45%
Gambir	10,784	38.91	3.03		Alc. insol. 21.27%
Gambir	10,784	43.02	0.75		
Gamboge Pow.	10,446	76.05	1.22	Mostly sol.	
Gamboge Pow.	10,768	76.09	3.40	Mostly sol.	
Gentian Rt. Pow.	9,972	40.89(49)	3.42		
Gentian Rt. Grd.	10,090	40.00(49)			
		42.55			

¹ Loss in weight on drying to constant weight at 105° C.
² These figures previously referred to by the authors, A. Jr. P. 84.5. 196 are given here for ready reference.

TABULATION OF ASSAYS.—Continued.

Sample	Sample No.	Moist.	Alc. Ext.	Water Ext.	Ether Ext.	Ash.	Sol. Ash. HCl	Remarks
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
Ginger Af.	10,761		6.27		5.48	3.92	Soluble	Vol. Ether Ext. 1.95 %
Ginger Af. Pow.	9,827		6.40		5.95	4.63	Mostly sol.	
Ginger Af. Grd.	10,047		5.04		5.45	4.41	Mostly sol.	
Ginger Af. Grd.	10,113		5.10		5.50	4.50	Mostly sol.	
Ginger Jam. Bleached.	10,760		4.80		2.95	4.04	Soluble	Vol. Ether Ext. 1.00 %
Ginger Jam.								Vol. Ether Ext. 1.05 %
Unbleached								
Ginger Jam. Pow.	10,759		4.15		3.10	3.35	Soluble	
Ginger Jam. Pow.	9,828		6.95		4.30	3.98	Soluble	
Ginger Jam. Pow.	10,036		3.94		3.50	3.26	Soluble	
Ginger Jam. Pow.	10,572		4.70		3.15	3.15	Soluble	
Ginger Jam. Grd.	10,747		5.75		3.98	3.64	Soluble	
Glycyrrhiza Pow.	10,437			39.75		4.23	Soluble	
Glycyrrhiza Pow.	10,461			28.93		6.40	Soluble	
Glycyrrhiza Grd.	10,465			22.80		6.40	Soluble	
Glycyrrhiza Grd.	10,466			25.10		6.80	Soluble	
Grains Paradise	—		6.15		5.28	2.22	Mostly sol.	
Grains Paradise Pow.	10,062		6.28		5.46	3.18	Partly sol.	
Guaiac.	9,478		87.50			4.58		
Guaiac.	9,579		91.15			1.90		
Guaiac.	9,652		80.00			3.00		
Guaiac Strained	9,701		95.60			1.13		
Guaiac Strained	10,002		96.73			0.75		
Guaiac.	10,181		77.95			3.41	Mostly sol.	
Guaiac Pow.	9,325		88.10			3.66		
Guaiac Pow.	9,371		76.56			3.58		
Guaiac Pow.	9,372		92.64			1.63		
Guaiac Pow.	9,543		80.98			4.77		
Guaiac Pow.	9,580		87.65			2.99		
Guaiac Pow.	10,534		75.65			4.15	Pract. sol.	Contained 16.00 % Foreign Lvs.
Henna Lvs.	10,201					7.08		

Henna Lvs.	10,238	13.84	28.33		11.43 12.40	Mostly sol.	Contained 19.01% Foreign Lvs.
Henna Lvs. Pow.	9,420						Dyeing test—not as deep color as blank
Henna Lvs. Pow.	9,865						Dyeing test—not as deep as blank
Henna Lvs. Pow.	10,005	24.14	31.68		9.30	Pract. sol.	
Insect Flow.	9,552	15.70		7.62	6.40		
Insect Flow.	9,553	16.25		8.08	6.40		
Insect Flow.	9,554	16.82		7.75	6.05		
Insect Flow.	9,555	14.98		8.28	7.05		
Insect Flow.	9,556	14.97		7.97	5.90		
Insect Flow.	10,364	16.20		7.80	6.60		
Insect Flow. Pow.	9,401	12.44		6.07	6.45		Pet. Ether Ext. 2.63%
Insect Flow. Pow.	9,402	16.85		7.04	9.21		Pet. Ether Ext. 2.98%
Insect Flow. Pow.	9,447	15.21	9.35	6.50	10.18	Partly insol.	
Insect Flow. Pow.	9,448	13.63	9.34	6.92	5.83	Mostly sol.	
Insect Flow. Pow.	9,622	17.78		8.00	7.66		
Insect Flow. Pow.	10,176	11.06		5.18	5.74	Soluble	Contained too few pollen grains
Insect Flow. Pow.	10,327	10.85		4.85	6.02	Contained too few pollen grains	
Juniper Ber. Pow.	10,482	48.97			2.71	Soluble	
Kamala.	9,387	70.94		63.25	5.02		
Kino.	9,859	45.10			2.10	Mostly sol.	Tests of identity O. K.
Kino.	9,944	62.66	43.75		1.60	Soluble	Tests of identity O. K.
Kino.	9,990	79.40	67.90		1.47	Pract. sol.	Tests of identity O. K.
Krameria Grd.	7,394	32.88(49)					
Krameria Grd.	9,867	32.68(49)			2.25	Soluble	
Lactucarium.	10,093		23.46		5.30		
Larkspur Seed.		42.26		42.00	5.85	Pract. sol.	Garbled = 11.73% stems 7.01% pods;
Larkspur Seed Pow.	10,546	48.20		43.80	5.84	Pract. sol.	68.18% Broken
Lobelia Herb.	10,661	16.54			8.20	Soluble	Leaves

TABULATION OF ASSAYS.—Continued.

Sample	Sample No.	Moist.	Alc. Ext.	Water Ext.	Ether Ext.	Ash	Sol. Ash. Dil. HCl.	Remarks
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
Lobelia Herb. Pow. . . .	10,475		12.60			7.62	Mostly sol.	Microsc. cont. large amt. woody tissue
Mace.	10,858		31.00		26.85	1.36	Soluble	Vol. Ether Ext. 7.1%
Mace Pow.	9,965		83.79		26.00	2.35	Soluble	Test for rosin (odor when burned) negative
Mastic Pow.	9,845				94.97			
Matico Lvs.			22.70(73)		12.23	13.90	Insol.	Vol. Ether Ext. 0.75%
Matico Lvs. Pow. . . .	10,170		27.15(73)		13.43	13.80	Insol.	Vol. Ether Ext. 0.55%
Mustard Blk. Pow. . .	10,103				37.16	4.50		
Mustard Blk. Grd. . . .	10,456				37.03	4.22	Soluble	
Mustard Yel. Grd. . . .	10,454				33.85	4.85	Soluble	
Mustard Yel. Grd. . . .	10,455		14.70		15.47	4.60	Soluble	
Myristica	10,762				38.35	2.42	Soluble	Vol. Ether Ext. 2.85%
Myristica Pow.	9,978				39.85	1.96	Soluble	Pet. Ether Ext. 36.19%
Myristica Pow.					36.15	1.23	Soluble	Pet. Ether Ext. 34.6%
Myrrh	10,639	9.02	21.35			8.39	Partly sol.	
Myrrh Pow.	10,056	7.03	40.58			1.41	Soluble	
Nut Gall Pow.	10,021		76.96			3.70		
Orange P. Bit.						4.25		
Orange P. Bit. Po. . . .	9,954				3.53	2.20	Soluble	Vol. Ether Ext. 1.75%
Orris Rt. Pow.	9,541				3.85	1.75	Soluble	Vol. Ether Ext. 0.50%
Orris Rt. Pow.	9,851		9.25		3.18	1.72	Soluble	Vol. Ether Ext. 0.50%
Orris Rt. Pow.	10,115				3.75	1.60	Soluble	Vol. Ether Ext. 0.60%
Orris Rt. Pow.	10,368				4.22	1.75	Soluble	
Orris Rt. Pow.	10,635				9.18	4.67	Insol.	
Pepper Blk.		12.02	9.95	9.28			Insol.	
Pepper Blk. Pow.	10,038	7.70	10.80	10.82		4.03	Insol.	Chlor. Ext. 2.98%
Podophyllum Grd. . . .	10,281		14.67		3.85	5.10	Partly sol.	

Podophyllum Pow. ...	10,436	10.30	4.15	4.2	Pract. sol.	Chlor. Ext. 3.51 %
Quassia Ch.ps.	10,490	6.01(33)		2.30	Soluble	
Quassia Pow.	10,440	5.40(33)		2.95	Soluble	
Resin Scammony.	9,473	97.20	84.95	0.63		Chlor. Ext. 94.25 %
Resin Scammony.	9,661	95.44	65.42	0.05		Chlor. Ext. 70.55 %
Resin Scammony.	9,662	91.82	59.05	0.28		Chlor. Ext. 63.75 %
Resin Scammony.	9,901	95.50	63.25	0.45		Chlor. Ext. 75.05 %
Resin Scammony.	9,943	46.92	45.42	0.15		Chlor. Ext. 45.40 %
Resin Scammony Pow. ...	9,603	93.33	70.03	0.17		Cont. potato starch
Resin Scammony Pow. ...	9,640	94.30	65.20	0.12		Chlor. Ext. 81.80 %
Rhubarb Pow.	10,037	39.18(78)		9.16	Soluble	Chlor. Ext. 72.80 %
Rhubarb Pow.	10,353	43.40(78)		6.95	Soluble	Alc. Ext. (49 %) 34.36 %
Rhubarb Grd.	10,255	40.70(78)		6.70	Soluble	Alc. Ext. (49 %) 43.05 %
Sabadilla Seed.	A	27.50	22.79	3.28	Soluble	Alc. Ext. (49 %) 43.40 %
Sabadilla Seed.	B	26.50	20.05	6.92	Soluble	
Sabadilla Seed Pow. ...	9,423			7.35		
Sabadilla Seed Pow. ...	9,686			6.00		
Sabadilla Seed Pow. ...	9,792			14.80	Pract. insol.	
Sabadilla Seed Pow. ...	9,966			10.05	Pract. insol	
Sabadilla Seed Pow. ...	10,165	33.13	24.40	7.45	Mostly insol.	
Sabadilla Seed Pow. ...	10,486	33.17	21.60	11.15		
Sabadilla Seed Pow. ...	10,289	34.58	24.45	10.10	Mostly insol.	
Sabadilla Seed Pow. ...	10,421	34.15	23.86	10.22	Mostly insol.	
Sabadilla Seed Pow. ...	10,769	24.74	18.93	10.13		
Saffron.	10,058					Garbled, styles 17.8 % Stamens 2.02 %
Saffron.	10,094				Soluble	Garbled, styles 7.5 %
Saffron.	10,304	10.50		4.90		Stamens .65 %
Saffron.		11.26		4.59	Soluble	Garbled, styles 6.8 %
Saffron.	10,492	13.08		4.85		Stamens 1.20 %
Sage Grd.	9,850				Pract. sol.	Garbled, styles 8.9 %
Sage Pow.	10,077	11.63		8.05	Soluble	Stamens 2.03 %
Santonica.		19.96	12.76	8.72	Mostly sol.	
Santonica Pow.	10,039	26.16	14.89	9.03	Mostly sol.	

TABULATION OF ASSAYS.—Continued.

Sample	Sample No.	Moist.	Ale. Ext.	Water Ext.	Ether Ext.	Ash	Sol. Ash. HCl	Remarks
Sarsaparilla Hon.	10,510	Per Cent. 7.00	Per Cent. 10.60(33)	Per Cent.	Per Cent.	Per Cent. 10.27		Appear. fine (no dirt, stems or rhiz)
Sarsaparilla Hon. Pow.	10,441		18.87(33)			8.20	Mostly insol.	
Sarsaparilla Mex.	10,509	7.08	15.90(33)			15.04		Appear. poor: cont. 18.74% stems and rhiz. dirt 32.35%
Sarsaparilla Mex. Pow.	10,442		14.50(33)			32.45	Insol.	
Saw Palmetto Grd.	10,284		42.25			1.65	Pract. sol.	
Senna Alex.	9,461			41.83		8.42	Pract. insol.	
Senna Alex.	9,628			52.10				
Senna Alex.	10,397			32.84				
Senna Alex.	10,322							
Senna India.	9,462							
Senna Alex. Cut.	9,388							
Senna Alex. Grd.	9,392							
Senna Alex. Pow.	9,390			27.80		8.52	Soluble	
Senna Alex. Pow.	9,767			29.31		11.93	Partly sol.	
Senna Alex. Pow.	9,916			31.95		13.44	Mostly insol.	
Senna Alex. Grd.	10,633			36.25		21.00	Mostly insol.	
Senna India Grd.	9,391					16.53		
Senna India Grd.	10,654					8.65	Pract. sol.	
Senna India Pow.	9,594		32.25(49)	29.6		9.00	Soluble	
Senna India Pow.	10,169			29.43		9.73	Pract. sol.	
Shellac Pow.	10,571		91.10			8.75	Pract. sol.	
Simaruba Bk. Pow.	10,472					8.77	Pract. sol.	
Sloe Berries Cut.	10,783		30.3			9.01	Pract. sol.	
Soap Bk. Pow.	10,478	9.38		39.50	4.95	1.39	Soluble	
Starch Corn.	10,352					2.22	Soluble	
Starch Maranta.	10,402					2.91	Pract. sol.	
Valerian Rt.	9,314	15.05	34.38(49)			11.57		Ext. calcul. to dry basis 40.48%

The sample of powder, No. 9395, contained aleurone grains and stone cells from the seed and stone cells characteristic elements of the peel. Sample of powder No. 9511 contained practically no aleurone grains, but contained the characteristic stone cells of the rind.

Guaia.—The determination of the acid number is very unsatisfactory, owing to the color of the solution.

Hellebore, White.—Five samples assayed by the method given below yielded 1.027, 0.641, 0.995, 1.445, and 0.916 per cent. total alkaloids, respectively. *Method.* Transfer 15 gms. of the sample in fine powder to an eight ounce bottle, add 150 Cc. chloroform ether mixture (4 and 1) and shake for 10 minutes. Add 5 Cc. ammonia water, 10 per cent., and shake in mechanical shaker for 4 hours. Filter through cotton and collect 100 Cc. Transfer to separatory funnel and extract with normal sulphuric acid. Wash the acid solution with chloroform and reject the chloroform. Add ammonia water in excess and extract with chloroform. Evaporate the chloroform solution in a tared beaker or flask, dry, and weigh. Weight equals total alkaloids in 10 gm. of the sample.

Henna Leaves.—Dyeing test—boil 2 gm. sample in 100 gm. water for 10 minutes, cool and make up loss of water. Filter and to 30 Cc. of the filtrate add 2 Cc. dilute sulphuric acid, immerse in the solution a strip of white flannel weighing about 0.5 gm. and boil for 10 minutes. Rinse flannel, and then "strip" in 50 Cc. water containing 4 Cc. ammonia water, boiling 10 minutes. Rinse and dry flannel and mark No. 1. Add 2 Cc. dilute sulphuric acid to the ammoniacal solution and another strip of white flannel weighing about 0.5 gm. and boil for 10 minutes. Rinse and dry flannel and mark No. 2. Compare sample with a selected sample of leaves.

Kino.—Tests of identity; ferric chloride T. S. added to an aqueous solution produces a gray black precipitate. Lead acetate T. S. added to an aqueous solution produces a gray purplish precipitate. Tartar emetic added to an aqueous solution produces a light brown precipitate.

Lycopodium.—Ten samples contained ash as follows: 1.42, 1.10, 3.35 (contained sand); 1.23, 1.28, 1.55, 1.30, 1.39, and 2.60 per cent. (contained sand).

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THE ALKALOIDAL CONTENT OF INDIVIDUAL
PLANTS OF *DATURA STRAMONIUM L.*
AND *DATURA TATULA L.**

BY F. A. MILLER AND J. W. MEADER.

The examination of individual plants of *Datura Stramonium L.* and *Datura Tatula L.* for their total alkaloidal content has been undertaken for two reasons: first, as a means of following the effects of prolonged cultivation upon the percentage of alkaloids, and, second, as a means of selecting high yielding individual plants. These high yielding plants are intended to serve as parents of future generations from which continued selections can be made. In these selections the object is to develop pure strains which, it is hoped, will exhibit a racial improvement in relative alkaloidal value over wild plants or those cultivated without any effort toward improvement. It has been shown¹ that the application of certain nitrogenous fertilizers to members of the Solonaceous family, and especially belladonna, will cause a perceptible increase in the alkaloidal content. This increase, however, does not represent an improvement as understood by plant breeders. It is environmental and thus only temporary. What is most needed to further the advancement of drug growing is a permanent improvement of the more valuable medicinal plants. This may be accomplished through the application of special methods of breeding as now practised by plant breeders, horticulturists, and florists.

Little has been done on the cultivation and improvement of stramonium except in the case of a few species, which are grown for decorative purposes. Experimental plots of several species have been grown but apparently have not been continuously cultivated. As to improvement, there is no evidence of any attempts having been made, except that by Meyer² to hybridize *Datura Metel L.* and *Datura Stramonium L.*

Members of the genus other than *Datura Stramonium L.* have been reported upon favorably and may be found through further investigation to be equally valuable. *Datura Metel L.* has been shown by Schmidt³ and⁴ to contain as much hyoscyamin as *Datura Stramonium L.*, also that *Datura alba Nees*, which is grown in

* Presented to Section VIII B, Eighth International Congress of Applied Chemistry.

China, India, and southern Europe for decorative purposes, contains hyoscyamin and some atropin in the seed. Hesse⁵ also found considerable amounts of alkaloid in this species. Peinemann⁶ is quoted as having found more alkaloid in the leaf, seed, and root of this species than in the corresponding parts of *Datura Stramonium L.* Kircher⁷ examined *Datura Metel L.*, *Datura quercifolia* and *Datura arborea L.*, finding in the leaves and seeds of *quercifolia* an average of 0.418 per cent. and 0.292 per cent. of alkaloids respectively. He also noted the presence of alkaloids in *Datura Metel L.* and *Datura arborea L.*

The desirability of cultivating and improving *Datura Stramonium L.* is indicated by an examination of commercial conditions. These conditions, as enumerated below, indicate a wide range of variations in percentage of alkaloids from year to year and from different geographical sources. Feldhaus,⁸ in the examination of twenty-five commercial samples from various sources, notes a variation of from 0.211 per cent. to 0.495 per cent., with an average of 0.328 per cent. In 1901 he found an average of 0.476 per cent., while in 1902 the average was only 0.337 per cent. Farr and Wright⁹ state that in 1906 they found a maximum of 0.30 per cent. and a minimum of 0.12 per cent., average 0.22 per cent. They quote Kordeas as having found 0.20 per cent. and Umney 0.39 per cent. to 0.41 per cent. Smith, Kline and French Co.¹⁰ in 1908 report on sixteen assays which indicate a range of from 0.25 per cent. to 0.37 per cent., nine of these being below the United States Pharmacopœial standard. In 1911¹¹ they again report on fifteen assays ranging from 0.22 per cent. to 0.35 per cent., three of these being below the standard, seven not exceeding 0.28 per cent., and five running above 0.30 per cent. Vanderkleed¹² in 1907 reported on nineteen assays ranging from 0.15 per cent. to 0.62 per cent. Again in 1908¹³ he considers twenty-five samples of which the lowest was 0.13 per cent., highest 0.51 per cent., average 0.34 per cent. Twenty-one of these were above and four below the official standard. Hankey¹⁴ examined lots which ran as low as 0.14 per cent., with an average of only 0.25 per cent. for the best. Puckner¹⁵ gives a variation of from 0.13 per cent. to 0.45 per cent., as found in sixteen samples. Average results from the Lilly laboratories for the past five years indicate an annual variation and a recent annual decrease in alkaloidal content: 1907, 0.34 per cent.; 1908, 0.40 per cent.; 1909, 0.38 per cent.; 1910, 0.32 per cent., 1911, 0.25 per cent. The fore-

going data indicates the desirability of a *uniform high yielding plant*.

The objects of the present investigation have already been stated. The species used were *Datura Stramonium L.* and *Datura Tatula L.*, both common in this country. The plants of *Datura Stramonium L.* were grown from seed purchased in the London market. This seed was not absolutely pure, as one *Datura Tatula L.* plant appeared in the experimental plot from the first planting. The *Datura Tatula L.* plants used in the experiment were transplanted from a vacant lot in Indianapolis. The two forms were grown under the same conditions on soil consisting of stiff clay loam. Cultivation was frequent and continued until mature seed could be obtained.

The samples of leaves for assay from the *Datura Tatula L.* plants were collected August 17, 1910. At this time the plants bore mature but unripe seed pods, open flowers and numerous buds. August 30th, the plot of *Datura Stramonium* had reached a corresponding stage of maturity and samples were collected on this date. In both cases, individual plants of vigorous growth were selected and numbered. The samples as removed from these individuals were given the corresponding number of the plant and retained separately. Later, mature seeds were collected from the same plants. The number of leaves removed was in no instance so great as to interfere with normal growth.

The samples were thoroughly cured at room temperature and stored in paper bags until one year later, when they were assayed. The individual plants assayed as follows:

No. B-979.....	<i>Datura Stramonium L.</i>	0.47 per cent.
No. B-980.....	<i>Datura Stramonium L.</i>	0.55 per cent.
No. B-981.....	<i>Datura Stramonium L.</i>	0.52 per cent.
No. B-982.....	<i>Datura Stramonium L.</i>	0.46 per cent.
No. B-983.....	<i>Datura Tatula L.</i>	0.63 per cent.
No. B-984.....	<i>Datura Tatula L.</i>	0.65 per cent.
No. B-985.....	<i>Datura Tatula L.</i>	0.47 per cent.

The process of the United States Pharmacopœia for the assay of stramonium was used, taking liberal amounts of solvent in all cases, and with the exception that N/20 hydrochloric acid was substituted for N/10 sulphuric acid in titrating.

It will be noted from the foregoing figures that there is a marked variation in the total alkaloidal percentage of individual plants. Attention has been called to the variation in commercial stramonium for different years and for different geographical sources. Little is

known, however, upon the behavior of the percentage of alkaloids in individual plants. True¹⁶ has found that individual belladonna plants vary from 0.2 per cent. to 0.7 per cent. in total alkaloids. The extremes as found for *D. Stramonium L.* are maximum 0.55 per cent., minimum 0.4 per cent., and *D. Tatula L.*, maximum 0.65 per cent., minimum 0.47 per cent.

Datura Tatula L., a species very closely related botanically to the official *Datura Stramonium L.*, indicates a much higher alkaloidal percentage than the U. S. Pharmacopœial species. Both forms considered, likewise show a higher percentage than any commercial drug examined during the past five years. The maximum for this period at the Lilly laboratories being 0.40 per cent., minimum 0.25 per cent., and average 0.33 per cent. The results obtained also demonstrate that continuous cultivation does not interfere with the natural formation of a high percentage of alkaloids.

The investigation of individual plants from this group is to be continued upon the same plan. Seeds were collected from the plants assayed, and those from the highest and lowest yielding plants will be planted and individuals again tested. In one case the object is to bring about an increase in the percentage of alkaloids, while in the other it is to decrease this percentage.

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- ⁴ Schmidt: Arch. der Pharm., 1910, 248, 641.
- ⁵ Hesse: Pharm. Jr., 1900, 64, 250.
- ⁶ Peinemann: Handelsbericht von Gehe & Co., 1896.
- ⁷ Kircher: Arch. der Pharm., 1905, 243, 309.
- ⁸ Feldhaus: Arch. der Pharm., 1905, 243, 328.
- ⁹ Farr & Wright: Pharm. Jr., 1906, 76, 310.
- ¹⁰ Smith, Kline & French Co.: Anal. Rept., 1908, 36.
- ¹¹ Smith, Kline & French Co.: Anal. Rept., 1911, 42.
- ¹² Vanderkleed: Proc. Penn. Pharm. Assoc'n, 1907, 90.
- ¹³ Vanderkleed: Proc. Penn. Pharm. Assoc'n, 1908, 88.
- ¹⁴ Hankey: Am. Drug., 1907, 50, 9.
- ¹⁵ Puckner: Proc. Am. Pharm. Assoc'n, 1906, 440.
- ¹⁶ True: Oil, Paint and Drug Reporter, 1911, 80, 29.

From the Departments of Botany and Analytical Chemistry.

ELI LILLY & COMPANY,

Indianapolis, Ind.

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PROGRESS OF THE REVISION OF THE
UNITED STATES PHARMACOPŒIA.¹

BY JOSEPH P. REMINGTON, PH.M.

It will doubtless be of interest to the members of the American Pharmaceutical Association to be informed on the present state of the work of the Committee of Revision.

It will be remembered that an Executive Committee of fifteen, chosen by the votes of the General Committee of fifty-one, have immediate charge of the work of revision. The work was divided into fifteen parts, and a member of the Executive Committee was chosen as the chairman of each sub-committee. The members of the sub-committees were selected for their special knowledge of the subjects treated by each sub-committee, and several members are members of several sub-committees. In each case the member was consulted before his appointment, as it was particularly desirable that each member should contribute his share of work to the general fund.

Like every constructive work of this character, which is voluntary, some members have borne a greater share of the work than others. Some are very willing to assume, at the outset, obligations which they cannot fulfill and events proved that the chairmen of the sub-committees have had to proceed without their help. This has thrown a large amount of work upon the chairmen who have had to send in their reports to the Executive Committee after the continuous urging of the general chairman to keep going.

Admissions and Deletions.

Experience has again demonstrated the value of the plan, which was first used in the last revision of the Pharmacopœia, of culling out the subjects which require little or no revision and starting work upon them. This was particularly the case with the report on admissions and deletions. A preliminary list was sent out for which it was believed a majority of the sub-committee would cer-

¹ By special vote of the Council of the American Pharmaceutical Association this report was released from the usual rule with regard to advance publication.—EDITOR.

tainly vote for admission, leaving debatable subjects for later consideration. This enabled the chairman of the Executive Committee to begin the work and give a number of subjects to each sub-committee for a start. From time to time the chairman of the sub-committee on Scope reported lists of other subjects which had obtained a majority of votes for admission and at the last meeting of this Association in Boston the tentative list was submitted, and, with very few exceptions, has received the general approval of those interested in the Pharmacopœia. Some of the physicians on the General Committee have vigorously objected to the admission of some of the drugs and preparations found in this list, for it must be understood that a small but active number of physicians believed that only a very limited number of drugs and preparations should be admitted to the Pharmacopœia. A larger number of the members of the committee desired the admission of drugs and preparations that are used to a large extent in any section of the country.

In the writer's opinion, entirely too much stress has been laid upon this part of the work. Physicians will continue to prescribe unofficial substances as they always have; some even pride themselves upon the fact that they have no use for the Pharmacopœia, and that they do not use such common things as do the general run of practitioners. But the committee have not accepted the view of a skeleton Pharmacopœia, nor have they approved of a padded one.

While upon this subject, it should be stated that the list has not yet been closed and it is proposed to make a few more additions and deletions.

Patented Products, Synthetics, Etc.

The subject of admitting controlled products, patented, copyrighted, or otherwise monopolized, has been made a subject of debate. This question has always proved a stumbling-block in previous revisions, and the question is more important to-day because of the immense number of such products now in general use. Manufacturers and their agents have been very active in insisting upon their legal rights in protecting their property. Physicians have been luke-warm and the majority insist on prescribing anything which they believe will aid their patients to recover health.

The great difficulty is the practical one of introducing into the Pharmacopœia any substance over which there can be no control of identity and purity. The Pharmacopœia might introduce a con-

trolled product under its name or a new name, but of what use would be the official tests? The manufacturer could at will alter his product in some way, by changing its color or in some other unimportant particular. The National and State Food and Drug Acts would, of course, recognize the official preparation, but it could not be had in the market and it would be taking up valuable space. The manufacturers almost to a unit declare that they do not care whether the Pharmacopœia admits their products or not. Naturally they do not care to have any authorized supervision over their property, and, so long as their sales are not interfered with, they do not want to be hampered in any way.

Our courts have recognized proprietary rights in medicines, and the introduction of controlled products would amount to an advertisement showing that such and such a product had found favor in the sight of the Committee of Revision. The complications would be endless. There would probably be two kinds of the same preparation on the market—the manufacturers' and the official. A physician prescribing such a preparation might have the manufacturers' product in mind; the pharmacist might have in stock only the official.

In cases where the patent has run out on certain largely used synthetics, phenacetin, for instance, the difficulty has been met by introducing the substance under a different name, but many of the largely used synthetics are sold under patents which are still alive. It would seem that the only solution would be to have an agreement with the manufacturer, firm, or corporation controlling the product, but this would be of doubtful utility and would only obtain in a very few cases. The manufacturer would not care to imperil any of his right to exclusive manufacture. Where a patent will run out within a year or a comparatively short time, he might be willing, for the sake of the advertisement and to increase his sales somewhat, particularly in view of a competing preparation which was supplanting the older product.

Nomenclature.

The subject of nomenclature has been settled by the Executive Committee on the following basis:

"That changes in the titles of articles at present official be made only for the purpose of insuring greater accuracy, brevity or safety

in dispensing, and that in the case of newly admitted articles titles be chosen which are in harmony with general usage and convenient for prescribing, the scientific name being given at least as a synonym in the case of chemicals of a definite composition.

"That in stating the strength of acids in the U. S. P. they be stated in such terms as Hydrogen Chloride, HCl , 'absolute hydrochloric acid;' Hydrogen Phosphate, H_3PO_4 , 'absolute orthophosphoric acid;' Hydrogen Acetate, CH_3COOH , 'absolute acetic acid,' etc."

It is not likely that there will be any serious objection to continuing the present style of latinization so that it would affect the labels at present in use throughout the country. The experience of 1906 and 1907 of manufacturers, wholesale druggists, retail druggists, and physicians when the Food and Drugs Act went into effect is one long to be remembered. Many thousands of dollars worth of labels had to be destroyed and the labor, confusion, and loss of money was very great. But it was worth the trouble and the label to-day has vastly more significance than ever before.

Synonyms.

The subject of synonyms has correspondingly increased in importance. Some druggists seek to evade the official requirements by avoiding an official title and they use a name which will permit the sale of the substance without incurring much risk. It is difficult to see how the Pharmacopœia can cover the field thoroughly, because like when exterminating rats, if one hole is stopped another is sure to be opened in a new place. There is no question, however, that the list of synonyms in the Pharmacopœia will have to be increased.

Physical Factors.

The question of stating solubilities of substances in the Pharmacopœia has occupied much attention. Of course it would be most desirable to give an exact figure for the solubility of a substance in water, boiling water, alcohol, diluted alcohol, glycerin, ether, chloroform, petroleum benzin, fixed oils, and other solvents. It would also be desirable to introduce a uniform method of taking solubilities. There are physical difficulties, however, which would lead to false figures and the methods of the physical laboratory, which are most accurate, would be entirely unsuited for the use of the pharmacist and physician. For a book like the Pharmacopœia

the latter rarely require a method which necessitates a thermostat or a continuous agitation apparatus or a method which requires a long time to determine the exact solubility. But the principal reason for making an exception and not inserting a uniform method for solubilities is that solubilities alone are inconclusive tests for identity or purity. They are useful physical factors within certain ranges, but in view of the abuses which might arise, particularly in legal contests, where solubilities are stated with decimal figures and because it would be possible to involve honest manufacturers, retail druggists and others in needless criticism and often unjust accusation, it has been deemed best to state solubilities in rounded figures or by giving a range. It is not proposed to drop the use of figures in stating solubilities, but a statement will be inserted in the Introductory Notices of the Pharmacopœia giving the reasons for not regarding solubilities as conclusive tests. This question is, however, open for further consideration.

Melting points, boiling points, and specific gravities do not fall within this category, and uniform methods for obtaining these physical factors will doubtless be inserted.

Standard Temperature.

The Executive Committee and General Committee of Revision have voted to retain 25° C. (77° F.) as the standard temperature for specific gravities and other purposes. A table will likely be inserted in the Appendix giving corresponding values at 15° and 20° C. for official specific gravities.

The work on the Inorganic and Organic Chemicals is nearly completed and this occupies the largest number of pages in the book.

Pharmacognosy and Botany is well advanced. The reports on Galenical Preparations are well in hand. There still remain the editing and the preparing of the final manuscript. This, of course, cannot be done until all of the reports have been passed upon. When this work is completed, printing will begin and publicity will be given to whatever changes have been made in tests and standards.

The following table shows the number of pages of official Bulletins, Letters, and Circulars issued by the various sub-committees and committees, although the communications from firms, corporations, physicians, pharmacists, scientific bodies, and the public generally, and the replies thereto are not included in the summary, although they constitute a large amount of correspondence.

SUB-COMMITTEE BULLETINS.

No. 1.	Scope	288
No. 2.	Therapeutics, etc.	156
No. 3.	Biological Products, etc.....	80
No. 4.	Botany and Pharmacognosy	252
No. 5.	Inorganic Chemistry	430
No. 6.	Organic Chemistry	797
No. 7.	Proximate Assays	270
No. 8.	Volatile Oils	89
No. 9.	Fluid and Solid Extracts.....	218
No. 10.	Waters and Spirits	175
No. 11.	Syrups and Elixirs	253
No. 12.	Cerates and Ointments	49
No. 13.	Miscellaneous Galenicals	121
No. 14.	Tables, Weights, etc.....	75
No. 15.	Nomenclature
	Executive Committee Letters	1311
	General Committee Circulars	596
	<hr/>	
Total	5160

The text has been reported to the Executive Committee for 500 articles to this date.

THE CLASSIFICATION OF CARBON COMPOUNDS.¹

BY MARSTON TAYLOR BOGERT.

(Continued from p. 413)

In 1836, Laurent advanced his nucleus theory which, although never generally accepted, was used by Gmelin in his "Handbook," with certain alterations, as a foundation for a classification of organic compounds. According to this theory, every organic compound contains a group of atoms termed a "nucleus" or "germ." Primary nuclei consist of carbon and hydrogen, and in these the hydrogen may be replaced by other elements or groups of elements, thus giving rise to derived or secondary nuclei, analogous in composition and chemical properties to the primary nuclei. Other atoms may be attached to this nucleus, or they may quite surround it, and when these are removed the primary nucleus reappears.

¹ Reprinted from *Proc. Amer. Philos. Soc.*, July, 1912, pp. 252-268.

In 1839, Dumas developed his substitution theory to a theory of chemical types. An advance was made in the replacement of the dualistic formulas by unitary ones.

Gerhardt's residue theory appeared at about this time. It may well be explained in comparison with the older radical theory. According to the latter, ethyl nitrate, for example, was regarded as the nitrate of ethyl oxide $(C_2H_5)_2O.N_2O_5$; while, according to Gerhardt, the combination of the nitric acid and alcohol occurs in such a manner that one compound gives up a hydrogen and the other a hydroxyl, forming water, the two "residues" then uniting to ethyl nitrate.

The discovery of the compound ammonias by Wurtz (1849) and Hofmann led to the arrangement of organic compounds on types of various simple inorganic bodies. For example, it was assumed that the hydrogen in ammonia not only could be replaced atom for atom by other elements, but also by compound radicals.

Gerhardt's type theory was really a combination of his residue theory with the older radical theory. His four fundamental types were hydrogen, hydrochloric acid, water and ammonia; $H-H$,

H
 $H-Cl$, $H-O-H$, $N-\overset{H}{H}$, to which Kekulé subsequently added
 H

methane, CH_4 . These proving insufficient, multiple and mixed types were invented.

So early as 1838, Gerhardt had called attention to the fact that by the action of sulphuric acid upon various substances compounds were produced in which the characteristic properties of the constituents were not present. To distinguish such, he coined the term "copulated compounds." His original views were considerably enlarged and modified by Berzelius. According to this point of view, many radicals were assumed to be composed of several simpler ones. Thus, the fact that many monobasic acids (written on the water type) could frequently be decomposed with liberation of the CO group as CO_2 , together with the alcohol radical, caused the acid radicals to be looked upon as made up of CO and an alcohol radical, $CH_3.CO-O-H$, instead of C_2H_5O-O-H , and paved the way for the modern structural formulas.

It was Williamson who showed that the existence of compound radicals could be assumed just as well for inorganic as for organic

compounds, and that organic chemistry could no longer be correctly designated as "the chemistry of the compound radicals."

With the discovery of substances common to both plants and animals, the subdivision of organic chemistry into vegetable and animal chemistry was quite generally abandoned.

Gmelin says in his "Handbook" (Vol. VII., pp. 4 and 5):

"Carbon is the only element which is essential to organic compounds; every one of the other elements may be absent from particular compounds, but no compound which in all its relations deserves the name "organic" is destitute of carbon. . . . If we were to regard as organic those carbon compounds which have been classed hitherto among inorganic substances, namely carbonic oxide, carbonic acid, sulfide of carbon, phosgene, cast iron, etc., we might define organic compounds simply as 'the compounds of carbon'; but organic compounds are still further distinguished by containing more than one atom of carbon. . . . Hence the term 'organic compounds' includes all primary compounds containing more than one atom of carbon."

This last qualification was unfortunate, for it was soon shown that the atomic weight of carbon was 12, instead of 6, and that, therefore, methyl alcohol and formic acid contained only one atom of carbon and would be excluded from organic compounds by the above definition.

Kane, several years before (about 1840), had exposed himself to no such difficulty. In his "Elements of Chemistry" he discussed all organic compounds as carbon derivatives and prefaced this chapter with the following remarks:

"The element which is peculiarly organic and which, with the one exception of ammonia, exists in all bodies derived from an animal or vegetable source, is carbon. It is hence that I have deferred the description of carbon and its compounds until I could pass directly from it to the great variety of organic bodies of which it is the basis. With the constituents of inorganic bodies it has but an accidental connection; for, as I shall hereafter show, there is no form of carbon which has not at some time made part of an organized being."

In the great "Handwörterbuch" of Liebig, Poggendorff and Wöhler (1851), we find the following:

"Since, however, a natural boundary between organic and inorganic compounds in general does not exist, and can no longer be assumed, since we know that both are subject to the same combining laws, and since, therefore, if a separation is desired, an artificial and arbitrary boundary line must be drawn, it appears simplest to designate organic chemistry directly as 'the chemistry of the carbon compounds,' and only a few, namely the simplest

carbon compounds— CO_2 , CO , COCl_2 , CS_2 and carbamic acid—are more conveniently referred to inorganic chemistry."

Kekulé later (1866) expressed himself in similar vein. He says:

"We must come to the conclusion that the chemical compounds of the vegetable and animal kingdoms contain the same elements as those of inanimate nature. We know that in both cases the same laws of combination hold good, and hence that no differences exist between organic and inorganic compounds either in their component materials, in the forces which hold these materials together, or in the number or mode of grouping of their atoms. . . . If, however, for the sake of perspicuity, a line of demarcation is to be drawn, we must remember that this boundary is an empirical rather than a natural one and may be traced at any point which seems most desirable. If we wish to express by 'organic chemistry' that which is usually considered under the name, we shall do best to include all carbon compounds. We, therefore, define organic chemistry as 'the chemistry of the carbon compounds,' and we do not set up any opposition between inorganic and organic bodies. That to which the old name of organic chemistry has been given, and which we express by the more distinctive term of the chemistry of the carbon compounds, is merely a special portion of pure chemistry, considered apart from the other portion only because the large number and the peculiar importance of the carbon compounds renders their special consideration necessary."

This change in the significance of the term "organic" chemistry marks the passing of the old Vitalistic doctrine, and before we lose sight of it altogether, it may not be amiss to quote some interesting passages from Meldola's recent work on the "Chemical Synthesis of Vital Products." He says, among other things, that while it is quite true that we can produce in the laboratory substances identical with those formed in the living organism, in the majority of cases we cannot maintain that the syntheses are identical in their mechanism, and those who would "explain" the biochemical processes by a simple chemical equation should bear in mind the fact that "the sign connecting the two sides of the equation stands for the whole unexplored region of biochemical transmutations." We lack exact knowledge of the nature of the synthetic processes going on in the living organism, and there is little reason for believing that they have much analogy with our laboratory methods. In fact, we cannot duplicate in the laboratory the most fundamental of all these syntheses—the photosynthesis accomplished by plants, in which carbon dioxide is absorbed by an organic compound and the product decomposed with liberation of oxygen. While the author does not at all array himself on the side of the vitalists, he concludes, from the summary of experimental results recorded in his book,

"that the testimony of pure chemistry cannot, as it stands at present (*i. e.*, about 1904), be legitimately interpreted into a direct negation of Vitalism in any form. This negation may, and probably will be made possible in the future, when our chemical methods have been made to approximate more closely to the vital methods."

Until about the year 1830, it was supposed that the same element could present itself in only one form, endowed with one invariable set of properties, and that from the combination of the same elements in the same proportions, only one and the same substance could possibly result. The discovery of isomeric compounds, consequently, led to a more careful search for the cause of the difference in the properties of substances with the same percentage composition. With the establishment of the correct relations of atom, molecule and equivalent, the way was opened for the valence hypothesis, and in 1858 Kekulé said:

"I do not regard it as the chief aim of our time to detect atomic groups which, owing to certain properties, may be considered radicals, and thus to include the compounds under certain types, which in this way have scarcely any other significance than that of type or example formulas. I am rather of the opinion that the generalization should be extended to the constitution of the radicals themselves, to the determination of the relation of the elements among themselves, and thus to deduce from the nature of the elements both the nature of the radicals and that of their compounds."

The recognition of the quadrivalence of carbon atoms and their power of uniting with each other, accounted for the existence and combining value of radicals, as well as for their constitution. The type theory therefore found a broader generalization and amplification in the extension of the valence hypothesis of Kekulé and Couper to the derivatives of carbon.

While in years gone by, as has been said, the classification of carbon compounds was mainly or exclusively according to the source from which they were obtained, in modern times the classification has been based solely upon their structural relations and entirely independent of their origin.

One of the first to adopt this method of classification was Löwig, in 1840. Gmelin, in 1848, arranged carbon compounds in his "Handbook" according to the number of carbon atoms they contained, and subdivided them on lines similar to those suggested in Laurent's nucleus theory, as already mentioned.

Schiel, in 1842, remarked upon the fact that alcohol radicals form a simple and regularly graded series of bodies, of which the

properties as well as the composition exhibit corresponding regular gradations, and he predicted the existence of other similar series. Shortly afterward, Dumas pointed out that the fatty acids constitute such a series. Gerhardt, in his "*Précis de Chimie Organique*" (1844), collected a large number of such groups, gave to them the name "homologous series," and distributed them under the general divisions suggested by his type theory. This recognition of homologous series as the units in classifying organic compounds was a great step in advance, simplified the classification enormously, and was very fruitful in stimulating investigation to discover other similar series.

The terms "fatty" and "aromatic" chemistry appeared about 1858. At first used in more restricted sense, they were gradually extended until the former covered all acyclic compounds and the latter nearly all cyclic. This subdivision of organic chemistry has been generally adopted (with few exceptions) ever since. More recently, it has been found advisable, particularly in the larger textbooks, to split up aromatic chemistry into carbocyclic and heterocyclic. So that we now have the three classes, fatty (or aliphatic), carbocyclic (or isocarbocyclic), and heterocyclic. And yet this classification is no longer satisfactory, for there is no sharp dividing line between straight-chain and cyclic compounds, the one merging gradually into the other. Certain cyclic structures (as the ethylene oxides, lactones, lactames, imides, etc.) are invariably discussed under fatty chemistry, and certain straight-chain compounds (like the olefin terpenes and their derivatives) are generally taken up under aromatic chemistry, while the alicyclic compounds, as their name indicates, form the natural transition from aliphatic to cyclic structures.

With the filling in of the gaps heretofore existing between aliphatic and aromatic chemistry, the time seems appropriate for a change in our classification of carbon compounds which shall recognize the essential unity of the subject, and no longer give the impression that organic chemistry is composed of three varieties of chemistry—fatty, carbocyclic and heterocyclic.

The method which appeals particularly to the writer, and which he has followed with his classes at Columbia University for the past ten years, is to begin with the hydrocarbons, as the simplest carbon compounds, and discuss in succession the various series of hydrocarbons, saturated and unsaturated, acyclic and cyclic, before

passing on to the next group. After a careful consideration of these fundamentally important compounds, other classes of carbon compounds are taken up in similar manner; all of the simple halogen derivatives being considered together, all the nitro bodies, all the alcohols, and so on. All other classes are very conveniently regarded as derivatives of the hydrocarbons. With a knowledge of the properties of the various series of hydrocarbons, the study of their derivatives then resolves itself chiefly into the following questions: (1) What are the characteristic properties of the group under consideration (be it halogen, amino, carboxyl, or any other group)? (2) In what manner are its properties influenced by the hydrocarbon nucleus to which it is attached, and by the other groups present? (3) How are the properties of the entire molecule likely to be affected by the introduction of such an element or group? To take a single case, by way of illustration, the simple hydroxyl derivatives of the hydrocarbons are numerous and important, and certain well defined characteristics cling to the hydroxyl group irrespective of the particular hydrocarbon nucleus to which it is attached. Thus, its hydrogen may be replaced by metals (giving alcoholates or phenolates), by hydrocarbon radicles (giving ethers), by acid radicals (giving esters), or the entire hydroxyl may be replaced by a halogen by acting upon it with a phosphorus halide. That the behavior of this hydroxyl group is influenced, however, by the hydrocarbon nucleus to which it is attached, can be seen at once by comparing a phenol with an alcohol. Further, the presence of the hydroxyl group alters the properties of the entire molecule, as appears immediately when we compare the behavior of benzene and of phenol towards bromine, nitric acid, oxidizing agents, and so forth.

In this way, the characteristic properties of the different substituents may be firmly fixed in the mind, as well as the general nature of the various classes of organic compounds, and the student learns to associate certain chemical reactions with certain chemical structures, and to reason intelligently from a given structural formula as to the chemical behavior of the substance, whether he ever heard of the compound before or not, thus learning not only to reduce correct constitutional formulas, but also a grasp at a glance the chemical properties summarized by such formulas.

This method of classification saves an immense amount of repetition and brings home very clearly the fundamental properties and

relationships of organic compounds, as well as the application of these properties in analytical and industrial chemistry. Another advantage which follows from this arrangement, is the manner in which it lends itself to laboratory illustration. As all compounds containing the same substituting element or group are discussed together, examples for laboratory practice may be drawn from either the acyclic or the cyclic field.

The author claims no originality for this suggested classification, except so far as certain details are concerned, for it was recommended and adopted so long ago as 1864 by that distinguished Russian chemist, Butlerow, in his "*Lehrbuch der organischen Chemie*," and has won adherents in this country in Professors W. A. Noyes, Kremers, and possibly others. My reasons for presenting it at the present time are the evident need for some change in our present system, brought into the foreground by the approaching publication of the new edition of Beilstein's monumental "*Handbuch der organischen Chemie*" and the creation of national commissions on the nomenclature of organic compounds, and my firm belief, as the result of experience, that the adoption of such a system will aid in inspiring and stimulating greater interest in the study of organic chemistry.

COLUMBIA UNIVERSITY, NEW YORK, N. Y.,

ORGANIC LABORATORY,

April 15, 1912.

THE EIGHTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

BY M. I. WILBERT, Washington, D. C.

The inaugural meeting of the Eighth International Congress of Applied Chemistry was held at Washington, on September 4, under the patronage of the President of the United States, who, owing to an accident, was unable to take an active part in the opening meeting, but addressed the members later at a reception given at the White House.

The scientific and business meetings of the Congress were held in New York from September 6 to 13 inclusive. The Congress was attended by nearly 2000 chemists, coming from thirty different

countries, and the general consensus of opinion appears to have been that in many respects at least this Congress has been the most successful ever held and that it should prove to be an important factor in the development of chemistry and related sciences in this country.

It is unfortunate that pharmacists, as such, did not see fit to take a greater interest in the proceedings of the Congress, for this calling is not alone the origin of applied chemistry, but is clearly dependent on applied chemistry for its present day existence and future continuance.

To illustrate the comprehensive nature of the Congress, it will serve to point out that more than 1000 papers had been placed upon the tentative official program and that a number of additional communications were accepted later and announced in the "Daily Journal." Despite the fact that in many, though not all, of the sections the officers ruled that a paper could only be presented by its author. The final report of the Secretary shows that 436 papers were presented and discussed in the several Sections of the Congress.

The twenty-four sections into which the Congress was subdivided were designated as follows:

- I. Analytical Chemistry.
- II. Inorganic Chemistry.
- IIIa. Metallurgy and Mining.
- IIIb. Explosives.
- IIIc. Silicate Industries.
- IV. Organic Chemistry.
- IVa. Coal Tar Colors and Dyestuffs.
- Va. Industry and Chemistry of Sugar.
- Vb. India Rubber and other Plastics.
- Vc. Fuels and Asphalt.
- Vd. Fats, Fatty Oils and Soaps.
- Ve. Paints, Drying Oils and Varnishes.
- VIa. Starch, Cellulose and Paper.
- Vib. Fermentation.
- VII. Agricultural Chemistry.
- VIIIa. Hygiene.
- VIIIb. Pharmaceutical Chemistry.
- VIIIc. Bromatology.
- VIIId. Biochemistry, including Pharmacology.
- IX. Photochemistry.
- Xa. Electrochemistry.
- Xb. Physical Chemistry.
- XIa. Law and Legislation Affecting Chemical Industry.
- XIb. Political Economy and Conservation of Natural Resources.

Sections VIIIb, VIIIa and VIIIc, despite the fact that they dealt primarily with subjects of direct interest to pharmacy in the wider sense, appear to have been much less popular than some of the other sections, both in regard to the size of the published volumes of original communications and also in regard to space occupied in the official program.

Another rather disappointing feature in connection with the proceedings of the Section on Pharmaceutical Chemistry is the fact that of the eighteen communications presented to this Section but one was presented by its author at the meeting for which it was announced.

These were minor shortcomings, however, that were more than counterbalanced by the really interesting nature of the addresses made by some of the foreign delegates to the Congress, and the further fact that the Section on Pharmaceutical Chemistry was practically the only one to complete its program as printed.

The credit for this somewhat unique accomplishment is due primarily to the intrepid and always present chairman, Prof. Jos. P. Remington, and also, to a considerable extent, to the strenuous acting secretary, Mr. Otto Raubenheimer.

The varied nature of the several papers that were presented to this Section is well shown by the following more or less random selection of titles from the official program:

Francis Ransom and H. J. Henderson. "Belladonna. The Effect of Cultivation and Fertilization on the Growth of the Plant and on the Alkaloidal Content of the Leaves."

Francis H. Carr. "The Effects of Cultivation upon the Alkaloidal Content of *Atropa Belladonna*."

F. A. Miller and W. F. Baker. "The Potency of First Year Cultivated *Digitalis* Leaves as Indicated by Physiological Assay."

Henry Kraemer. "The Influence of Heat and Chemicals on the Starch Grain."

John C. Umney and E. J. Parry. "Unification of Processes for Commercial Analysis and Valuation of Essential Oils."

Atherton Seidell. "Solubility and Distribution Coefficients of Thymol."

H. V. Army. "International Standards for Colored Liquids and a Suggested Method of Standardization."

All of the papers printed in the volume of original communications are of value, but because of the fact that the writers of the

papers usually failed to present them in person many of the more valuable features were not sufficiently emphasized, and, therefore, an active interest in the work of the Section appeared to be lacking.

In addition to the papers announced on the regular program the Section listened to short addresses by F. Raschig and Hermann Vieth, of Ludwigshafen, Germany; K. Wooyenaka and Kintaro Wooyena, of Japan; Jokichi Takamini, of New York, one of the delegates of the Pharmaceutical Society of Japan; L. Weber, of Darmstadt, Germany; Rudolf Wegschneider, of Vienna, Austria; Frederick Power, of London, England; K. von Buchka, of Berlin, Germany, and Richard Lueders, of Hamburg, Germany.

The question of international standards for widely used medicaments was discussed at length and provisions made for securing the co-operation of other countries. The resulting resolution, as finally adopted by the Congress, was brought forward by the Commission on International Congresses, and, having received the unanimous endorsement of this body, was adopted.

As presented at the final meeting of the Congress it reads as follows:

Resolved, That Section VIIIb, of the Eighth International Congress of Applied Chemistry consider the feasibility of international standards of strength, purity, method of testing and nomenclature of pharmacopoeial preparations.

Resolved, Section VIIIb (Pharmaceutical Chemistry) of the Eighth International Congress of Applied Chemistry, having received and discussed the report of the International Commission on "Variation in the Activity of Toxic Drugs," resolves that it is desirable that this inquiry be continued and that the International Commission be performed and to consist of the following eight members:

Austria, Prof. Wilhelm Mitlacher; France, Prof. E. Bourquelot; Germany, Prof. H. Thoms; Great Britain, Francis Ransom; Netherlands, Prof. L. van Itallie; Russia, W. Ferrein, Mag. Ph.; Switzerland, Prof. A. Tschirch; United States, Dr. R. H. True, and the following three secretaries: G. P. Forrester, F.C.S., European continent; Peter McEwan, F.C.S., Great Britain; Otto Raubenheimer, United States.

It is further resolved that this commission be authorized to enlist the co-operation of other persons actively interested in promulgating international uniformity of standards for potent drugs and improvement in their cultivation and collection.

Resolved, That the International Commission of Congresses of Applied Chemistry be requested to approve the organization of an international committee under Joseph P. Remington, and composed of chemical experts approved by this commission, whose duty shall be to collect information from

every available source on chemical products and the essential oils used in pharmacy, and to investigate the tests now in use to prove the identity and purity of said products and oils; also, to consider standards and tests with the view of establishing uniformity in the same throughout the world, and to report to the Ninth International Congress the results of its work.

Throughout the Congress it was evident that the delegates from all of the different countries were desirous of securing greater uniformity not alone in the standards of strength and purity of medicines, but also greater uniformity in the methods of examining and even of sampling various products, and quite a number of committees or commissions were appointed to report to the Ninth International Congress which is to convene in St. Petersburg, Russia, in 1915, under the active presidency of P. Walden, of Riga.

Among the resolutions looking to international uniformity in standards and in methods of examination was one recommending that for all commercial purposes the international atomic weight table for 1912 be used until the meeting of the next Congress.

Other resolutions favored international standards for disinfectants, standard methods for the analysis of food products, uniform regulations concerning organic coloring matters, and uniform methods for sampling ores and fuels.

The general lectures and reviews, of which four were held in the great Hall of the College of New York, were in many respects the most interesting and most important features of the Congress.

The first of these general lectures was delivered by the eminent French chemist, Gabriel Bertrand, Professor of Chemistry at the Sorbonne, Paris, France, who, in discussing the part played by infinitely small amounts of chemical substances in agriculture, stated that cultural experiments have proven that a variety of elements, even some of the rarer elements, are necessary to maintain the proper conditions for plant, and, therefore, also, for animal life, and suggested that a further study of this fact will no doubt lead to a fuller appreciation of the need for maintaining the widespread distribution of elementary substances.

The second general lecture, by Carl Duisberg, the President of the Verein Deutscher Chemiker, was a comprehensive review of the present status of the German chemical industry, and the contributions that have been made by German chemists to further the progress of various lines of work and research and more particularly the influence that chemistry has exerted on the progress of medicine and hygiene.

In commenting on the production of synthetic products for use as medicine, he pointed out that in this connection much brilliant work has been accomplished, and the prospects for future development are so promising and so far reaching that no one could safely venture an opinion on the limitations of this branch of chemistry. As an illustration of the future possibilities in connection with pharmaceutical medical chemistry, he called attention to the success that has already attended the work of Ehrlich in the line of chemotherapy.

In connection with efforts that are being made for the safeguarding of human life and the promotion of human welfare, he called attention to non-inflammable artificial silk, to acetyl-cellulose that is also non-inflammable and is said to be equal to nitro-cellulose for moving picture films and to non-inflammable celluloid. He also exhibited a large quantity of synthetic rubber and stated that the economical production of this substance was one of the possibilities of the very near future.

The third general lecture, by William Henry Perkin, of Manchester, England, was devoted to the discussion of the permanent fireproofing of textile fabrics, especially of cotton goods which are ordinarily subjected to repeated washings. While no figures were quoted it was intimated that the annual loss of life, due to clothing catching fire, was quite large and could readily be avoided by the adoption of proper safeguards for rendering clothing non-combustible.

The fourth general lecture was delivered by Giacomo Ciamician, of Bologna, Italy, who prophetically outlined some of the possibilities of the photochemistry of the future, and discussed more particularly the tremendous waste of solar energy at the present time.

In addition to the general lectures of the Congress itself, a number of special lectures and addresses were given before joint sessions of two or more sections. Two of these lectures, the one by Samuel Eyde, on the oxidation of nitrogen, and the one by H. A. Bernthsen, on synthetic ammonia, were of immediate and practical importance, because they announced the actual commercial utilization of atmospheric nitrogen in the production of nitric acid and of ammonia. These two substances it was pointed out have an ever widening field for use while the evident supply is restricted, and any undue increase must be provided for. This it is thought has now been satisfactorily accomplished by the electrolytic production of nitrogen compounds directly from atmospheric nitrogen.

A third lecture, by Prof. W. H. Perkin, on the polymerization of butadiene and isoprene, reviewed the work that has been done by various investigators in the production of synthetic rubber, and pointed out that by means of biologic processes it had become not alone practicable but also economically possible to produce true rubber from isoprene or other compounds made from starch containing or cellulose containing materials.

The importance of this discovery from a public health point of view becomes evident when we recall the many and varied ways in which this material contributes to the comfort and well-being of the human race and the important part it has taken in developing many of the now essentially necessary conveniences like the telephone.

The one predominant feature of the Congress appears to have been the more or less clear recognition of the part that the divisions of photo and of phyto chemistry are to take in the development of the chemistry of the future, and, therefore, also, in the promotion of the public welfare and the safeguarding of the public health.

While this feature of chemical progress was perhaps best reflected in the lectures by Bertrand and Ciamician, referred to above, it was also evidenced by numerous other communications, more particularly in the Section on Pharmaceutical Chemistry, where it was reflected by the discussions on the effect of cultivation on the alkaloid content of drugs and on the variability in the composition of essential oils.

The same thought was also evidenced by at least two of the foreign delegates to the Congress in their addresses before the Section on Pharmaceutical Chemistry: P. Walden, of Riga, Russia, and Gustav Komppa, of Helsingfors, Finland.

These gentlemen in calling attention to some of the contributions of pharmacy to applied chemistry pointed out that the apothecary was of necessity the original phyto chemist, and that while it is true that this branch of chemical study had more recently been overlooked or frowned down upon, it was destined to take a very important part in the development of chemistry and of civilization generally, in the future.

A review of the Eighth International Congress of Applied Chemistry would be incomplete without calling special attention to the really unique and practically ideal provisions for the business and scientific meetings provided by the trustees of Columbia University.

Practically all of the Section meeting places were in the buildings of the University and many of the members of the Congress were provided with sleeping quarters, in the residence hall's, as guests of the University.

Other members were provided for in the immediate vicinity of the University, so that so far as these several features were concerned no fault could be found. The social features were numerous and varied, and it is to be hoped that despite a number of minor disappointments and the unseasonably warm weather the foreign delegates, as well as the American members, will remember the Eighth International Congress of Applied Chemistry as a brilliant success and as the direct incentive for progress in practically all of the ever-increasing lines of human endeavor in which chemistry can be applied.

ABSTRACTS OF PAPERS READ AT THE FORTY-NINTH
MEETING OF THE BRITISH PHARMACEUTICAL
CONFERENCE.

BY JOHN K. THUM, PH.G., Pharmacist at the German Hospital,
Philadelphia.

For the third time in its history, the British Pharmaceutical Conference held its forty-ninth annual meeting in the world-famous city of Edinburgh.

The sessions of the Conference were opened in the Debating Hall of the Edinburgh University Union on Tuesday, July 30. Sir Edward Evans, President, in the course of his address, remarked that he had just returned from a visit to the United States, and Canada, and had been very much impressed with the fact that the Government of the United States, in addition to being very particular as to the purity of all drugs sold in that country, have a Bureau of Plant Industry in connection with the United States Department of Agriculture. They issue bulletins from time to time, and mentioned four as follows: "The Wild Medicinal Plants of the U. S. A.," "American Root Drugs," "American Medicinal Barks," and "The Seeds and Plants Imported into the U. S. A." He believes that it is the investigations of this department that is the cause of the large increase in the use of barks, drugs, and roots of American origin. He thinks the Conference should consider the urging of

their government to develop such a department as exists in the United States.

In making a plea for the cultivation of drugs in their own country, he calls attention to the adaptability of the soil for this purpose, stating that what it does produce is far superior to any plant drugs grown elsewhere, for example, digitalis, henbane, colchicum, valerian, belladonna, peppermint, lavender, etc.

Sir Edward also spoke of the constantly increasing consumption of Cascara Sagrada. It is estimated that the crop of this valuable bark reaches annually about one thousand tons. The consumption is now almost ahead of the supply.

Among the many interesting papers brought to the attention of the members of the Conference were the following:

THE SUITABILITY OF VARIOUS COMMERCIAL PROTEINS FOR
PHARMACEUTICAL USE.

BY F. W. CROSSLEY HOLLAND.

The wide employment of protein substances in the arts has led the author to inquire into their suitability for extended employment in pharmacy.

Among vegetable proteins he mentions wheat protein, valuable for the preparation of medicated foods; soya bean protein, which contains 32 per cent. of protein, and no starch which is unusual in a leguminous seed; and castor oil bean protein, a prolific source of protein to be had at a low cost, its chief disadvantage being the presence of a substance which is irritating to the mucosa of the digestive tract.

Among animal proteins those of chief interest are: egg-albumen, gelatin, serum-albumen, and milk casein. These have found a limited use in pharmacy as emulsifying agents, although their suspensory powers are remarkable. The uses of gelatin in pharmacy are well known, yet it might be interesting to note that a warm solution of gelatin is coming into use as an emulsifying agent and gives good results with fixed oils.

SUGGESTIONS FOR THE MORE EXTENDED CULTIVATION OF DRUGS.

BY J. H. E. EVANS.

The author states that while in the United States, Germany, and other countries the government departments are doing much to

foster the drug plant industry, little assistance is given in England. Any advance which has been made is almost entirely due to private enterprise.

He states that the present source of supply of crude vegetable drugs are, in quantity and quality, restricted in area, and thus dependent on forces which cannot be controlled, such as weather, time and method of collection, labor available, and careless methods of preparing for market, leading to sophistication. He thinks that the influence of such natural causes might often, both as regards quality and quantity, be controlled by systematic cultivation, but that such cultivation must be scientific and organized.

Better attention as to time and method of collection has materially improved the quality of our crude drugs, and the author cites Belladonna root and Jalop root as examples in this regard; the former can now be obtained estimating 0.5 per cent. alkaloids and over; the latter can now be obtained containing resin well over the B. P. limit.

Among the causes of deterioration of drugs of vegetable origin inattention to proper drying is mentioned. Rapid deterioration of digitalis leaves by the action of enzymes when only air-dried is cited as an established fact.

The author also states that while cultivation appears to prevent the production of alkaloids in some plants, on the other hand, as in the case of cinchona, careful selection and cultivation have produced a strain which is much richer in alkaloid than any found in the wild state. Among the drugs which are cultivated more or less successfully at the present time he mentions the following: Calumba in Ceylon; eucalyptus and patchouli in the Tropics; belladonna in England, France, and America; coca in the West Indies, Ceylon and Zanzibar; kola nut in the Tropics generally; cinnamon in Ceylon; ginger in Japan; tumeric in the Tropics; ipecac in India, and to some extent in Brazil; valerian in England, Germany, and Austria; manna in Sicily; benzoin in the Strait Settlements; opium in the East, and many plants, such as peppermint, lavender, etc., in England.

Altogether the author makes an eloquent plea for drawing the attention of the government to the possibilities of drug cultivation in Great Britain and her Colonies. He states that it would be of benefit to the public generally and a practical means of working land and employing labor that is now unproductive.

ACTIVITY OF DIGITALIS LEAVES, AND STABILITY AND
STANDARDIZATION OF TINCTURES.

BY GORDON SHARP AND F. W. BRANSON.

It was the author's object in the work accomplished on this paper to ascertain if a tincture made with 90 per cent. alcohol retained its activity for a longer time than the ordinary pharmacopœial preparation. It was thought that the glucosidal deterioration might be due to a ferment, and that a stronger alcoholic menstruum might destroy it. The physiological testing was done by noting the action of a 60 and 90 per cent. alcoholic tincture on frogs after the preparations had been made four months. They came up to standard, although on the whole the stronger alcoholic preparation was not quite as toxic as the other. After a further period of time a subsequent test showed that the stronger alcoholic tincture was much less toxic than the other. The authors believe that the stronger alcohol decomposes the glucosides of the plant.

The authors also believe that a potent preparation can be produced from either wild and half cultivated plants; also, that leaves gathered in November are as active as those gathered in August; that leaves from plants which had flowered and from plants which had not yet flowered were equally toxic.

NOTE ON CALCIUM LACTATE.

BY C. A. HILL AND T. T. COCKING.

This salt as at present commercially available, is not by any means uniform in composition. As the use of this salt is increasing in medicine and as our knowledge regarding its solubility is somewhat unsatisfactory the authors of this paper deemed it desirable that this substance be investigated. They find that a pure calcium lactate can readily be prepared by precipitation with acetone from its cold saturated solution, washing the precipitated salt with acetone and then with ether.

AN OIL FROM AN EAST INDIAN BARK.

BY E. W. MANN.

The author gives some data in reference to a bark, which passes by the name of "Lawang." It yields an essential oil heavier than water, with a striking odor recalling nutmeg, sassafras, and clove.

It is doubtless derived from some species of *Cinnamomum*, *Litsea*, or an allied genus. Twenty-four kilos were coarsely ground and subjected to steam distillation, 120 grammes of oil being obtained. On subjecting this to examination the following constants were determined:

Specific gravity (15.5°)	1.0104
Rotation (100 mm.) at 20°	6.97°
Refractive Index at 15.5°	1.5111
Refractive Index at 20°	1.5095
Acid value	1.15
Saponification value	43.02
Ester value	41.87
Saponification value of acetylated oil	121.91

Further examination of the oil showed the presence of a crystalline acid with a melting-point 51° to 52°.

NOTE ON THE DETERMINATION OF LEAD IN CHEMICALS.

By G. D. ELSDON.

One of the difficulties encountered in carrying out the colorimetric lead test of Warrington is that of preparing a clear and bright solution of the chemical, something most essential in tests of this character. It has been pointed out that filtration, as, for instance, cream of tartar, may lead to a loss of lead, which occurs in minute particles in the metallic condition.

While making an examination of a series of chemicals for lead the author found that the lead left on the filter paper might be removed by washing with about 10 c.c. of 0.6 per cent. acetic acid.

THE TEST FOR BRUCINE IN STRYCHNINE.

By D. B. DOTT.

The usual test for brucine in strychnine is to pour HNO_3 on the crystals and observe whether any red color is produced. According to the author this test is unsatisfactory in that it is hard to notice or define the tint which quickly changes to a darker color caused by the rapid action of the strong HNO_3 on the strychnine. He gives some experimental evidence which shows that the rapidity of this color change is very much lessened by moderate dilution of the acid.

NOTE ON THE OILS OF AMMONIACUM, GALBANUM, AND ELEMI.

BY E. F. HARRISON AND P. A. W. SELF.

The above-mentioned gum-resins have been stated to be largely used as adulterants of asafetida; in considering how far the amount and characters of the oil of asafetida could be used to judge of its purity, it became necessary to take into consideration the amount and characters of the oils of these other gum-resins. The authors state that their investigations disclose the fact that any considerable addition of ammoniacum to asafetida would materially reduce the yield of oil. They state, however, that this fact is of little value for its detection, as the proportion of oil in asafetida is very variable. In their opinion the best means of detecting ammoniacum at present is by the hypobromite test applied to suspicious-looking tears. It was also shown that any considerable addition of either galbanum or elemi to asafetida would lower the specific gravity and refractive index of the oil to a very marked degree, and increase the dextro-, or reduce the lævo-rotation.

CONCENTRATED TINCTURES.

BY J. HAYCOCK.

The writer states that with regard to many of the concentrated tinctures on the market it would be foolish to claim that, when diluted, they represent the tinctures of the British Pharmacopœia. He then goes on to give the results of his method of extracting a long list of drugs for this class of preparations. Briefly, his method is to percolate the drug with industrial methylated spirit of suitable alcoholic strength, until thoroughly exhausted, then distilling off the spirit, and dissolving the soft extract in the official menstruum. Obviously it is not of avail for drugs valuable because of their volatile principles. These preparations were found to yield their full alkaloidal contents. No evidences of methyl alcohol were found upon examination.

FURTHER DATA IN REGARD TO ASAFETIDA.

BY E. F. HARRISON AND P. A. W. SELF.

The authors give a paper which is supplementary to one read before the Pharmaceutical Society in London on the oil of asafetida and the valuation of the drug. They record the character of further samples, some very grossly adulterated with mineral matter. From

the manner in which asafetida is gathered, it is inevitable that some foreign material should accompany it; but so long as the essential constituents, *i.e.*, the sulphur-containing constituents of the oil, do not fall below a reasonable limit, it seems absurd to condemn a parcel of the drug because pieces can be picked out of it here and there which do not show all the characters of the true drug.

NOTE ON IODINE-CONTENT OF THYROID GLANDS.

BY N. H. MARTIN.

The writer states that the iodine-content of thyroideum siccum from single glands varies more than the milk obtained from individual cows, and it is obviously as inadvisable to talk of fixing a standard from assays on a few glands as to fix a milk standard from analyses of milk obtained from a few animals instead of from herds. He also gives a tabulation covering a total number of over 6500 lobes, each estimation being made on the bulked product of some hundreds. His results are contradictory to the statement of Koch that there is three times the amount of iodine in Thyroideum Siccum prepared during the winter months as there is in that prepared in June and July. There is considerable range in the iodine-content, from 0.3 to 0.4 per cent.; which seems to indicate that so low a standard as 0.15 per cent. should not be adopted.

COMMERCIAL ESTERS USED IN PERFUMERY AND FOR
FLAVORING PURPOSES.

BY JOHN C. UMNEY AND C. T. BENNETT.

The flavor and "bouquet" of fruits are largely due to the presence of certain organic esters, and in making artificial flavoring-essences a considerable quantity of synthetic esters or "ethers" is employed. The authors state that impurities having objectionable odors must cause much difference when using artificial flavorings. They also state that the manufacture of pure products is dependent largely on the purification of both acids and alcohol; this point is emphasized where amyl alcohol and butyric acid is used. A review of an examination of a number of commercial samples is given and the statement made that the physical characters, such as specific gravity, solubility, and range of boiling-point, are useful factors in judging purity, as is likewise the refractive index.

A NOTE ON THE DETERMINATION OF NITRATES IN
BISMUTH CARBONAS, B. P.

BY WALTER RYLEY PRATT.

Seventeen samples of bismuth carbonas collected from various sources were examined by the author. He states that they were of varying specific gravity; some light and flocculent, others heavy and dense. In qualitatively testing for nitrates two color tests were used—the well-known brucine test and a new test, discovered by the author, which he claims is more delicate. It consists in the formation of an intense blue color on the addition of brucine, resorcinol, and concentrated H_2SO_4 to a nitrate. Only one sample showed the complete absence of nitrates by both tests, two gave a slight reaction, and fourteen showed the presence of considerable nitrate. He thinks that a limit of 2 per cent. of total nitrate calculated as $BiONO_3$ is generous and that it can be easily determined by his test. Considerable sulphates were also present, no doubt coming from sodium carbonate used in the manufacture; he advises more complete washing, and insists that a limit to alkalinity would be advisable.

Other papers read at the Conference were as follows: The Preparation of Bacterial Vaccines, by Ian S. Stewart, M.D. The Potency and Keeping Properties of Some Galenicals as Determined by Physiological Tests, by Alexander Goodall, M.D. The Formaldehyde Solution and Tablets of Commerce, by C. H. Hampshire and S. Furnival.

A Glucosidal Constituent of Ipecacuanha, by H. Finnemore and Dorothy Braithwaite.

Note on Hyoscine Hydrobromide, by H. Finnemore and Dorothy Braithwaite. The Measurement of Relative Tryptic Activity, by A. R. Schmidt. The Solubility of Ether in Normal Saline Solution, by Reginald R. Bennett. Unrecorded Microscopical Characters of Bael Fruit, by J. C. Shenstone. Japanese Aconite Root, by E. M. Holmes. Japanese Chillies, by E. M. Holmes.

BOOK REVIEWS.

THE PLANTS OF SOUTHERN NEW JERSEY, with especial Reference to the Flora of the Pine Barrens and the geographic distribution of the Species. By Witmer Stone, Curator Academy of Natural Sciences of Philadelphia. Trenton, N. J.

The New Jersey State Museum publishes almost annually an educational report for the benefit of the schools and of the people of the State. Any one who is familiar with the flora of the pine barrens of New Jersey can readily appreciate that the Curator of the State Museum would receive many requests for information concerning the plants of this interesting section and that there would be a strong sentiment among teachers for a book in which the plants of New Jersey are considered. Mr. Stone, who is well known for his field work on mammals and birds, and is very familiar with the flora of New Jersey, was selected to prepare an extensive work on "The Plants of Southern New Jersey."

The entire work consists of 828 pages with 129 plates of illustrations. The individual plants are not described and it is therefore expected that the work will be used in connection with one of the general botanical manuals. It shows, however, exactly which of the plants, described in the more general books, are to be found in Southern New Jersey and in what sections they are to be looked for. The basis of the present work is the field studies of Mr. Stone and a number of the members of the Philadelphia Botanical Club, some of whom are now deceased, as well as the published records contained in the several botanical works dealing with the region. "Wherever possible an actual herbarium specimen is cited for every locality mentioned under each species, so that questions of correct identification can readily be settled in the future by consulting this material."

This work is not only of interest to teachers and students of local botany but is of particular interest to botanists and naturalists generally, for in it is contained much information concerning the present condition and history of one of the most interesting botanical areas in the United States, and which is still one of the most extensive areas of the Middle States left in primeval condition. In his introduction Mr. Stone says: "This coastal plain region of New Jersey has always attracted the attention of naturalists because of the striking differences that are presented by its flora and fauna as compared with those of the higher ground of the Piedmont County to the north and west of it. Pennsylvanians often liken it to

a bit of the Southern States that has been transported northward. Its climate in winter is certainly milder; there is rarely a heavy snowfall, and what does fall soon disappears, while many Southern species of plant and insects and a few birds and mammals are found there which are unknown to the west of Philadelphia or elsewhere beyond the fall line. It may seem incongruous to find a 'Southern flora and fauna' by going eastward, as we do in the city of Philadelphia, but this is easily explained when we examine a map of the life zones of North America." Mr. Stone discusses in his introduction (a) the nature of the life zones and floral belts of Eastern North America; (b) the relationship between the flora of the coastal plain and that of the Piedmont Region; (c) the general geographical distribution of the plants comprising the flora of the New Jersey coastal plain; (d) the botanical subdivisions of the New Jersey coastal plain; (e) the special interesting features of the pine barrens, giving a list of the plants occurring there; (f) the plants of the coastal strip; (g) the plants of the Cape May district; (h) the maritime flora; (i) and finally the origin and relationship of the coastal plain flora of New Jersey.

It is very seldom that one finds in a book of this character so much of the individuality of the author. Mr. Stone has devoted much of his time to field work. He is furthermore thoroughly conversant with the explorations and collections of his colleagues engaged in botanical work, and views the living plants in the spirit of the plant-geographer or ecologist. By reason of his numerous observations and the copious notes which he has incorporated with nearly every species, Mr. Stone has written a work which will be of incalculable benefit to future students of botany and science, for it is a permanent record of a region that is rapidly undergoing the inevitable changes incident to deforestation, cultivation and settlement and it will be exceedingly difficult for the naturalists of the future to understand these changes without this connected record.

While there are very many features of this work that one is tempted to touch upon in a review, yet one of the most interesting that may be noted is his handling of the nomenclature question. He follows "the American Botanical Code except in the treatment of species and sub-species." While there may be an opportunity for differences of opinion on this question yet it is quite likely that botanists will ultimately agree with the zoologists and not place species and sub-species on different planes, whereby a plant may bear one name if it is recognized as a species and another if it is

called a species. In addition to his commendable attitude on this mooted question we are also to note that he has consistently followed the entering of *all* specific names with a lower case initial letter, according to the custom prevalent among zoologists. This is a great step in advance and is one that must be universally followed if we are to expedite our work. For after all we use names as a means to an end. These must be simplified so that it is not necessary to be continually using standard works of reference to determine whether the initial letter should be capitalized or not. We have troubles enough with nomenclature and we should devote more time in studying the plants and animals, their habits, etc., and everything that will simplify our work must lighten our labors and add to our knowledge of plants and animals.

H. K.

ELEMENTS OF VEGETABLE HISTOLOGY. For the use of students of Pharmacy, preparatory to the Study of Pharmacognosy. By Daniel Base, Ph.D., Professor of Chemistry and Vegetable Histology in the Department of Pharmacy, University of Maryland, Baltimore. Published by the author. 1912.

The author has for some years given considerable attention to the elaboration of the fundamental principles required in order that students in pharmacy might be well prepared to take up the study of pharmacognosy. The present work is the result of Dr. Base's many years' experience as a teacher and is to be commended. There are 26 chapters. In the first chapter, consisting of 31 pages, attention is given to the use of the microscope. Seven chapters are devoted to the consideration of some of the principal cryptogamic plants. The study of tissues and cell contents necessarily receive a much more extended treatment and 16 chapters are given to these subjects. There is also a brief chapter on the examination of sputum for the bacillus of tuberculosis and of gonorrhœal discharge for gonococcus. In the appendix will be found much practical information regarding reagents, the making of permanent mounts, etc.

All sincere students in pharmacognosy must welcome a book of this character, for it is only when the teachers engaged in this work are willing to take pains to develop their courses that we may expect the recognition on the part of analysts and pharmacists as to the practical value of the results in pharmacognosy. The subject is a difficult one and we must expect each teacher on this subject to contribute his share in solving the fundamental problems connected

with the presentation of this subject so that the student may master the necessary technique.

The work is illustrated with some 65 illustrations, most of which are taken from other works. We must commend Dr. Base for giving credit in connection with each illustration to the author of the original drawing. This practice has not been by any means universally followed by the authors of text-books in the United States and while we have often been inclined to call attention to this dereliction on the part of some authors yet for several reasons we have refrained from any such expression. We trust, however, that in calling attention to this elementary principle of justice to other authors that has been followed by Dr. Base, that all writers of text-books in the United States will in the future follow his example, for how can a teacher preach "the honor system" to his students when his practices are contrary to his teachings?

H. K.

THE STATE PHARMACEUTICAL EXAMINING BOARD OF PENNSYLVANIA.

NOTICE OF EXAMINATIONS.

Examinations for applicants desiring registration as Pharmacist or Qualified Assistant Pharmacist, will be conducted in the Philadelphia College of Pharmacy, 145 North Tenth Street, the Philadelphia Central High School, corner Broad and Green Streets, Philadelphia, and the Pittsburgh College of Pharmacy, corner Pride and Bluff Streets, Pittsburgh, on Friday and Saturday, November 8th and 9th, 1912.

Pharmacist Examination.—The Laboratory examinations will be given in the respective colleges of pharmacy on Friday morning, November 8th, 1912. Class No. 1 will meet at 9 o'clock and Class No. 2 at 11 o'clock. The Written and Specimen examinations in the Pittsburgh College of Pharmacy and Philadelphia Central High School on Saturday afternoon, November 9th, 1912, at 1 o'clock.

Assistant Pharmacist Examination.—At the Pittsburgh College of Pharmacy, corner Pride and Bluff Streets, Pittsburgh, Pa., and the Philadelphia Central High School, corner Broad and Green Streets, Philadelphia, Pa., on Saturday afternoon, November 9th, 1912, at 1.30 o'clock.

L. L. WALTON, *Secretary*,
Williamsport, Pa.

P. O. Box No. 395.

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